

WELDING TECHNOLOGY I

Welding Technology I includes classroom and laboratory experiences that develop a variety of skills in oxy-fuel cutting and Shielded Metal Arc welding. This course is designed for individuals seeking careers in Welding, Technician, Sales, Design, Research or Engineering. Emphasis is placed on safety at all times. OSHA standards and guide lines endorsed by the American Welding Society (AWS) are used. Instructional activities emphasize properties of metals, safety issues, blueprint reading, electrical principles, welding symbols, and mechanical drawing through projects and exercises that teach students how to weld and be prepared for college and career success.

- DOE Code: 5776
- Recommended Grade Level: Grade 11-12
- Recommended Prerequisites: None
- Credits: 2-3 credits per semester, maximum of 6 credits.
- Counts as a Directed Elective or Elective for the General, Core 40, Core 40 with Academic Honors and Core 40 with Technical Honors diplomas
- This course is aligned with postsecondary courses for Dual Credit:
 - Ivy Tech
 - INDT 114- Introductory Welding
 - WELD 108- Shielded Metal Arc Welding I
 - Vincennes University
 - WELD 101- Oxy-Acetylene Welding
 - WELD 103-Gas Metal Arc Welding

Dual Credit

This course provides the opportunity for dual credit for students who meet postsecondary requirements for earning dual credit and successfully complete the dual credit requirements of this course.

Application of Content and Multiple Hour Offerings

Intensive laboratory applications are a component of this course and may be either school based or work based or a combination of the two. Work-based learning experiences should be in a closely related industry setting. Instructors shall have a standards-based training plan for students participating in work-based learning experiences. When a course is offered for multiple hours per semester, the amount of laboratory application or work-based learning needs to be increased proportionally.

Career and Technical Student Organizations (CTSOs)

Career and Technical Student Organizations are considered a powerful instructional tool when integrated into Career and Technical Education programs. They enhance the knowledge and skills students learn in a course by allowing a student to participate in a unique program of career and leadership development. Students should be encouraged to participate in SkillsUSA, the CTSO for this area.

Content Standards

Domain – Workplace Competency

Core Standard 1 Students establish appropriate workplace behaviors and characteristics to prepare for completion of further education in welding training programs.

Standards

- WTI-1.1 Allocate the appropriate resources for task completion
- WTI-1.2 Demonstrate effective interpersonal skills
- WTI-1.3 Develop leadership skills
- WTI-1.4 Establish positive relationships with people from diverse backgrounds
- WTI-1.5 Research, analyze, and use data for work assignments
- WTI-1.6 Apply effective critical thinking, decision making, and problem-solving techniques
- WTI-1.7 Select and use appropriate tools and technology
- WTI-1.8 Implement quality assurance measures and safeguards
- WTI-1.9 Follows verbal instructions to complete work assignments
- WTI-1.10 Follows written instructions to complete work assignments
- WTI-1.11 Demonstrate effective listening and speaking skills
- WTI-1.12 Perform appropriate mathematical calculations correctly
- WTI-1.13 Exhibit a responsible work ethic
- WTI-1.14 Demonstrate accepted standards for ethical behavior
- WTI-1.15 Perform housekeeping duties
- WTI-1.16 Prepares time or job cards, reports or records

Domain – Career Development

Core Standard 2 Students apply and adapt appropriate personal and professional skills to effectively manage welding careers.

Standards

- WTI-2.1 Establish a personal career goal and develop objectives for achieving the goal
- WTI-2.2 Evaluate employment and career pathway opportunities related to established career interest(s)
- WTI-2.3 Create a continuing education plan that identifies further education and training options
- WTI-2.4 Prepare for exams leading to certifications recognized by business and industry
- WTI-2.5 Develop skills needed to enter the workforce
- WTI-2.6 Evaluate resources that keep workers current in the career field
- WTI-2.7 Demonstrate skills and attitudes needed for lifelong learning
- WTI-2.8 Apply effective money management strategies

Domain – Safety and Health in Welding

Core Standard 3 Students integrate proper safety procedures in class activities and projects to meet professional and governmental standards.

Standards

- WTI-3.1 Apply safe practices according to American National Standards Institute safety standards

- WTI-3.2 Utilize proper safe operation practices in work area
- WTI-3.3 Demonstrates proper use and inspection of ventilation equipment
- WTI-3.4 Demonstrates proper Hot Zone operation
- WTI-3.5 Select proper procedures actions for working in confined spaces
- WTI-3.6 Demonstrates proper use of precautionary labeling and MSDS information
- WTI-3.7 Demonstrates proper inspection and operation of equipment used for each welding and thermal cutting process used

Domain – Drawing and Welding Symbol Interpretation

Core Standard 4 Students interpret technical drawings and documents to perform welding processes to specifications.

Standards

- WTI-4.1 Analyze and interpret blueprints
- WTI-4.2 Interprets basic elements of a drawing or sketch
- WTI-4.3 Interprets welding symbol information
- WTI-4.4 Fabricates parts from a drawing or sketch

Domain – Manual and Mechanized Oxyfuel Cutting

Core Standard 5 Students create sound manual and automatic oxyfuel cuts on materials to meet industry standards.

Standards

- WTI-5.1 Perform manual and automatic oxyfuel gas cutting
- WTI-5.2 Performs safety inspections of manual oxy fuel gas cutting (OFC) equipment and accessories
- WTI-5.3 Makes minor external repairs to manual OFC equipment and accessories
- WTI-5.4 Sets up for manual OFC operations on carbon steel
- WTI-5.5 Operates manual OFC equipment on carbon steel
- WTI-5.6 Performs straight, square edge cutting operations in the flat position on carbon steel
- WTI-5.7 Performs shape, square edge cutting operations in the flat position on carbon steel
- WTI-5.8 Performs straight, bevel edge cutting operations in the flat and position on carbon steel
- WTI-5.9 Performs scarfing and gouging operations to remove base and weld metal, in flat and horizontal positions on carbon steel
- WTI-5.10 Performs safety inspections of mechanized OFC equipment and accessories
- WTI-5.11 Makes minor external repairs to mechanized OFC equipment and accessories
- WTI-5.12 Sets up for mechanized OFC operations on carbon steel
- WTI-5.13 Operates mechanized OFC equipment on carbon steel
- WTI-5.14 Performs straight, square edge cutting operations in the flat position on carbon steel using mechanized OFC
- WTI-5.15 Performs straight, bevel edge cutting operations in the flat position on of carbon steel using mechanized OFC
- WTI-5.16 Examines tacks, root passes, intermediate layers, and completed welds

Domain – Shielded Metal Arc Welding

Core Standard 6 Students execute appropriate Shielded Metal Arc welds on a variety of industrial metal to meet industry standards.

Standards

- WTI-6.1 Apply Shielded Metal Arc Welding (SMAW) welding process fundamentals to actual lab experiences
- WTI-6.2 Set up for SMAW operations on carbon steel
- WTI-6.3 Operate SMAW equipment on carbon steel
- WTI-6.4 Make fillet welds in all positions on carbon steel
- WTI-6.5 Make groove welds in all positions on carbon steel
- WTI-6.6 Pass SMAW welder performance qualification test (2G and 3G, uphill, limited thickness test plates) on carbon steel

Domain – Welding Inspection and Testing

Core Standard 7 Students evaluate various weld stages to meet inspection criteria.

Standards

- WTI-7.1 Examine cut surfaces and edges of prepared base metal parts
- WTI-7.2 Examine tacks, intermediate layers, and completed welds

Process Standards

Common Core Literacy Standards for Technical Subjects

Reading Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Key Ideas and Details

- 11-12.RT.1 Cite specific textual evidence to support analysis of technical texts, attending to important distinctions the author makes and to any gaps or inconsistencies in the account.
- 11-12.RT.2 Determine the central ideas or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.
- 11-12.RT.3 Follow precisely a complex multistep procedure when performing technical tasks; analyze the specific results based on explanations in the text.

Craft and Structure

- 11-12.RT.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific context relevant to *grades 11-12 texts and topics*.
- 11-12.RT.5 Analyze how the text structures information or ideas into categories or hierarchies, demonstrating understanding of the information or ideas.
- 11-12.RT.6 Analyze the author's purpose in providing an explanation, describing a procedure, or discussing an experiment in a text, identifying important issues that remain

unresolved.

Integration of Knowledge and Idea

- 11-12.RT.7 Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.
- 11-12.RT.8 Evaluate the hypotheses, data, analysis, and conclusions in a technical subject, verifying the data when possible and corroborating or challenging conclusions with other sources of information.
- 11-12.RT.9 Synthesize information from a range of sources (e.g., texts, experiments, simulations) into a coherent understanding of a process, phenomenon, or concept, resolving conflicting information when possible.

Range of Reading and Level of Text Complexity

- 11-12.RT.10 By the end of grade 12, read and comprehend technical texts in the grades 11-CCR text complexity band independently and proficiently.

Writing Standards for Literacy in Technical Subjects 11-12

The standards below begin at grade 11 and define what students should understand and be able to do by the end of grade 12. The CCR anchor standards and high school standards in literacy work in tandem to define college and career readiness expectations – the former providing broad standards, the latter providing additional specificity.

Text Types and Purposes

- 11-12.WT.1 Write arguments focused on *discipline-specific content*.
- 11-12.WT.2 Write informative/explanatory texts, including technical processes.
- 11-12.WT.3 Students will not write narratives in technical subjects. *Note: Students' narrative skills continue to grow in these grades. The Standards require that students be able to incorporate narrative elements effectively into arguments and informative/explanatory texts. In technical, students must be able to write precise enough descriptions of the step-by-step procedures they use in their technical work that others can replicate them and (possibly) reach the same results.*

Production and Distribution of Writing

- 11-12.WT.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- 11-12.WT.5 Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
- 11-12.WT.6 Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Research to Build and Present Knowledge

- 11-12.WT.7 Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
- 11-12.WT.8 Gather relevant information from multiple authoritative print and digital sources,

using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation

11-12.WT.9 Draw evidence from informational texts to support analysis, reflection, and research.

Range of Writing

11-12.WT.10 Write routinely over extended time frames (time for reflection and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.